

Attorney Docket No. JOHN-023

APPLICATION

FOR UNITED STATES LETTERS PATENT

SPECIFICATION

18 TO ALL WHOM IT MAY CONCERN:

19

20 BE IT KNOWN THAT I, **Clifford C. Johnson**, a citizen of the United States,
21 have invented a new and useful hydraulic stroke measuring system of which the
22 following is a specification:

1

2

3 **Hydraulic Stroke Measuring System**

4

5

6 **CROSS REFERENCE TO RELATED APPLICATIONS**

7 Not applicable to this application.

8

9

10 **STATEMENT REGARDING FEDERALLY
11 SPONSORED RESEARCH OR DEVELOPMENT**

12 Not applicable to this application.

13

14

15 **BACKGROUND OF THE INVENTION**

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18

19 **Field of the Invention**

20

21 The present invention relates generally to hydraulic cylinders and more
22 specifically it relates to a hydraulic stroke measuring system for accurately determining
23 the cylinder rod position within a hydraulic cylinder.

24

25

26 **Description of the Related Art**

27

28 Hydraulic cylinders have been in use within agriculture, construction and other
29 industries for years. A conventional hydraulic cylinder has a cylinder housing and a

1 cylinder shaft slidably extending from the cylinder housing. Pressurized hydraulic
2 fluid is input into the cylinder housing to force the cylinder rod inwardly or outwardly
3 with respect to the cylinder housing.

4

5 The main problem with conventional hydraulic cylinders is the user cannot
6 determine the exact position of the cylinder rod. A further problem with conventional
7 hydraulic cylinders is that equipment dependent upon the hydraulic cylinders are
8 sometimes operated at an incorrect depth or height. For example, if a planter is not
9 adequately lowered so that the discs are penetrating the ground surface at a desired
10 depth, the seeds will not be properly planted resulting in the loss of that crop.

11

12 While these devices may be suitable for the particular purpose to which they
13 address, they are not as suitable for accurately determining the cylinder rod position
14 within a hydraulic cylinder. Conventional hydraulic cylinders do not provide a system
15 for indicating the exact position of the cylinder rod.

16

17 In these respects, the hydraulic stroke measuring system according to the
18 present invention substantially departs from the conventional concepts and designs of
19 the prior art, and in so doing provides an apparatus primarily developed for the
20 purpose of accurately determining the cylinder rod position within a hydraulic
21 cylinder.

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2 **BRIEF SUMMARY OF THE INVENTION**

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4 In view of the foregoing disadvantages inherent in the known types of cylinder
5 systems now present in the prior art, the present invention provides a new hydraulic
6 stroke measuring system construction wherein the same can be utilized for accurately
7 determining the cylinder rod position within a hydraulic cylinder.

8

9 The general purpose of the present invention, which will be described
10 subsequently in greater detail, is to provide a new hydraulic stroke measuring system
11 that has many of the advantages of the hydraulic cylinder systems mentioned
12 heretofore and many novel features that result in a new hydraulic stroke measuring
13 system which is not anticipated, rendered obvious, suggested, or even implied by any
14 of the prior art hydraulic cylinders, either alone or in any combination thereof.

15

16 To attain this, the present invention generally comprises a measurement shaft
17 slidably positioned within a housing unit, a shaft bracket attachable between the
18 measurement shaft and a cylinder shaft of a hydraulic cylinder, a plurality of contact
19 members within the housing unit, a main contact attached to the measurement shaft for
20 selectively engaging one or more of the contact members, and a plurality of display
21 lights electrically connected to the contact members. The display lights illuminate
22 when the main contact engages the corresponding contact members.

23

24 There has thus been outlined, rather broadly, the more important features of the
25 invention in order that the detailed description thereof may be better understood, and
26 in order that the present contribution to the art may be better appreciated. There are
27 additional features of the invention that will be described hereinafter and that will form
28 the subject matter of the claims appended hereto.

29

1 In this respect, before explaining at least one embodiment of the invention in
2 detail, it is to be understood that the invention is not limited in its application to the
3 details of construction and to the arrangements of the components set forth in the
4 following description or illustrated in the drawings. The invention is capable of other
5 embodiments and of being practiced and carried out in various ways. Also, it is to be
6 understood that the phraseology and terminology employed herein are for the purpose
7 of the description and should not be regarded as limiting.

8

9 A primary object of the present invention is to provide a hydraulic stroke
10 measuring system that will overcome the shortcomings of the prior art devices.

11

12 A second object is to provide a hydraulic stroke measuring system for
13 accurately determining the cylinder rod position within a hydraulic cylinder.

14

15 Another object is to provide a hydraulic stroke measuring system that can be
16 utilized with various types of actuators including but not limited to hydraulic
17 cylinders.

18

19 An additional object is to provide a hydraulic stroke measuring system that
20 efficiently informs the user of the exact position of the cylinder shaft.

21

22 A further object is to provide a hydraulic stroke measuring system that
23 reassures a user that a piece of equipment is being operated properly.

24

25 Another object is to provide a hydraulic stroke measuring system that is
26 comprised of a simple construction.

27

1 Other objects and advantages of the present invention will become obvious to the
2 reader and it is intended that these objects and advantages are within the scope of the
3 present invention.

4

5 To the accomplishment of the above and related objects, this invention may be
6 embodied in the form illustrated in the accompanying drawings, attention being called
7 to the fact, however, that the drawings are illustrative only, and that changes may be
8 made in the specific construction illustrated and described within the scope of the
9 appended claims.

BRIEF DESCRIPTION OF THE DRAWINGS

1

2

3 Various other objects, features and attendant advantages of the present
4 invention will become fully appreciated as the same becomes better understood when
5 considered in conjunction with the accompanying drawings, in which like reference
6 characters designate the same or similar parts throughout the several views, and
7 wherein:

8

9 FIG. 1 is an upper perspective view of the present invention attached to a
10 hydraulic cylinder.

11

12 FIG. 2 is a side cutaway view of the present invention along with a display unit
13 illustrating the cylinder shaft in a first position.

14

15 FIG. 3 is a side cutaway view of the present invention along with a display unit
16 illustrating the cylinder shaft in a second position.

17

18 FIG. 4 is a side cutaway view of the present invention along with a display unit
19 illustrating the cylinder shaft in a third position.

20

FIG. 5 is a magnified side cutaway view of the housing unit showing the main contact in electrical contact with only one contact member.

23

24 FIG. 6 is a magnified side cutaway view of the housing unit showing the main
25 contact in electrical contact with two contact members.

26

27 FIG. 7 is a block diagram illustrating the overall electrical connections of the
28 present invention.

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2 **DETAILED DESCRIPTION OF THE INVENTION**

3 *A. Overview*

4 Turning now descriptively to the drawings, in which similar reference
5 characters denote similar elements throughout the several views, FIGS. 1 through 7
6 illustrate a hydraulic stroke measuring system 10, which comprises a measurement
7 shaft slidably positioned within a housing unit 20, a shaft bracket 50 attachable
8 between the measurement shaft and a cylinder shaft 16 of a hydraulic cylinder 12, a
9 plurality of contact members 46 within the housing unit 20, a main contact 44 attached
10 to the measurement shaft for selectively engaging one or more of the contact members
11 46, and a plurality of display lights 62 electrically connected to the contact members
12 46. The display lights 62 illuminate when the main contact 44 engages the
13 corresponding contact members 46.

14

15 *B. Measurement Unit*

16 The measurement unit is preferably attached to a cylinder shaft 16 of a
17 hydraulic cylinder 12 by a housing bracket 30. However, the measurement unit may be
18 attached to various other structures near the hydraulic cylinder 12. The measurement
19 unit measures an extended position of the cylinder shaft 16 with respect to the cylinder
20 housing 14.

21

22 The measurement unit is comprised of a housing unit 20, a plurality of contact
23 members 46, a measurement shaft, and a main contact 44. The housing unit 20
24 preferably has a tubular structure as shown in Figures 1 through 4 of the drawings.
25 The housing unit 20 may have various other structures other than illustrated in the
26 drawings as can be appreciated.

27

28 The plurality of contact members 46 are attached within the housing unit 20 as
29 shown in Figures 2 through 6 of the drawings. The contact members 46 are electrically

1 connected to the display lights 62 as best illustrated in Figure 7 of the drawings. The
2 display lights 62 are electrically connected to a power source 11 (e.g. battery, electrical
3 system of a vehicle) as further shown in Figure 7 of the drawings. The contact
4 members 46 are constructed of a metal structure capable of electrically communicating
5 with the main contact 44 to illuminate the corresponding display lights 62. The
6 contact members 46 are preferably aligned in a row and equidistantly spaced, wherein
7 the row of contact members 46 is aligned with the longitudinal axis of the cylinder
8 shaft 16 as shown in Figures 2 through 4 of the drawings.

9

10 As shown in Figures 2 through 4 of the drawings, a measurement shaft slidably
11 extends from within the housing unit 20. The measurement shaft is attachable to the
12 cylinder shaft 16 of the hydraulic cylinder 12 by a shaft bracket 50 or other structure as
13 shown in Figures 1 through 4 of the drawings. The shaft bracket 50 preferably is
14 attached to the end connector 18 of the cylinder shaft 16, however the shaft bracket 50
15 may be attached in various other locations along the cylinder shaft 16.

16

17 The main contact 44 is attached to an inner end of the measurement shaft as shown
18 in Figures 2 through 6 of the drawings. The main contact 44 is comprised of an electrical
19 conducting material that engages one or more of the contact members 46 based upon a
20 position of the measurement shaft. The main contact 44 is electrically connected to the
21 power source 11 as also shown in Figure 7 of the drawings. When the main contact 44
22 electrically contacts one or more of the contact members 46, an electrical circuit is closed
23 through one or more of the corresponding display lights 62 thereby illuminating the
24 corresponding display lights 62.

25

26 The main contact 44 is sufficient in length to engage at least two of the contact
27 members 46 simultaneously as shown in Figures 3 and 6 of the drawings. This allows
28 for the illumination of more than one of the display lights 62 to indicate positions of
29 the cylinder shaft 16 between two display lights 62. A bias member 42 is preferably

1 attached to the measurement shaft that applies a bias force to the main contact 44
2 towards the contact members 46 as best illustrated in Figures 5 and 6 of the drawings.
3

4 **C. Display Unit**

5 A display unit 60 is in communication with the plurality of contact members
6 46. The display unit 60 includes a plurality of display lights 62. Each of the display
7 lights 62 is electrically connected to one of the contact members 46 as shown in Figure
8 7 of the drawings. The display lights 62 indicate an extended position of the cylinder
9 shaft 16.

10

11 An indicia is preferably positioned adjacent to each of the display lights 62
12 indicating a position measurement. For example, the indicia may display the depth a
13 seeder is with ground surface.

14

15 **D. Operation**

16 The hydraulic stroke measurement system 10 is attached to a hydraulic cylinder
17 12 or other actuator unit. As the cylinder shaft 16 of the hydraulic cylinder 12 is
18 extended from the cylinder housing 14, the measuring shaft 40 moves correspondingly
19 as shown in Figures 2 through 4 of the drawings.

20

21 As the measuring shaft 40 is moved within the housing unit 20, the main
22 contact 44 makes electrical contact with one or more of the contact members 46 as
23 shown in Figures 2 through 6 of the drawings. Figure 2 illustrates the main contact 44
24 electrically contacting a single contact member 46 which illuminates a single display
25 light 62 within the display unit 60 corresponding to 24 inches. Figure 3 illustrates the
26 cylinder shaft 16 being retracted a finite distance with the main contact 44 electrically
27 contacting two contact members 46 which illuminates two corresponding display lights
28 62 within the display unit 60 corresponding to 18 inches and 24 inches (thereby
29 representing a measurement between these two).

1.

2 As to a further discussion of the manner of usage and operation of the present
3 invention, the same should be apparent from the above description. Accordingly, no
4 further discussion relating to the manner of usage and operation will be provided.

5

6 With respect to the above description then, it is to be realized that the optimum
7 dimensional relationships for the parts of the invention, to include variations in size,
8 materials, shape, form, function and manner of operation, assembly and use, are
9 deemed to be within the expertise of those skilled in the art, and all equivalent
10 structural variations and relationships to those illustrated in the drawings and
11 described in the specification are intended to be encompassed by the present invention.

12

13 Therefore, the foregoing is considered as illustrative only of the principles of
14 the invention. Further, since numerous modifications and changes will readily occur to
15 those skilled in the art, it is not desired to limit the invention to the exact construction
16 and operation shown and described, and accordingly, all suitable modifications and
17 equivalents may be resorted to, falling within the scope of the invention.